ABSTRACT OF THE DISCLOSURE

The present invention relates to controlled, magnetohydrodynamically-driven, fluidic networks containing a plurality of individually controlled branches. The branches consist of conduits equipped with pairs of electrodes that are controlled by electrode controllers. In operation, the network is placed within a magnetic field and potentials or currents are applied across electrode pairs within the various branches of the network in specifically determined magnitudes and polarities for specifically determined time intervals in accordance with an activation sequence that may be determined by an algorithm. Placed within a temperature gradient, at least a part of the network can act as a thermal cycler for use in biological interactions that employ temperature variations. The invention also relates to magnetohydrodynamic stirrers comprising a conduit or cavity having at least two electrodes disposed in such an orientation that, upon the application of a potential or current across the electrode pair within a magnetic field, secondary flows such as chaotic advection is generated.